

What is claimed are:

1. An apparatus for controlling fuel injection of an engine provided with an intake valve and a fuel injection valve disposed on the upstream side of said intake valve, comprising:  
an injection quantity regulator varying an injection quantity per unit time of said fuel injection valve;  
an opening period detector detecting an opening period of said intake valve; and  
a controller controlling said injection quantity regulator according to the opening period detected by said opening period detector.
2. An apparatus for controlling fuel injection of an engine according to claim 1,  
wherein said engine is provided with a variable valve event and lift mechanism that varies a valve lift and a valve operating angle of said intake valve, and  
said opening period detector detects the valve operating angle of said intake valve and a rotation speed of said engine as a state amount correlating to the opening period of said intake valve.
3. An apparatus for controlling fuel injection of an engine according to claim 2,  
wherein said controller controls said injection quantity regulator, so that a fuel injection period of said fuel injection valve becomes shorter than the opening period of said intake valve at least in a low valve lift region of said intake valve.
4. An apparatus for controlling fuel injection of an engine according to claim 3,  
wherein there is provided an injection timing controller controlling injection timing of said fuel injection valve, so that fuel injection by said fuel injection valve is performed within the opening period of said intake valve at least in the low valve lift region.
5. An apparatus for controlling fuel injection of an engine according to claim 2,  
wherein said controller controls the injection quantity per unit time to become larger as the rotation speed of said engine is higher.
6. An apparatus for controlling fuel injection of an engine according to claim 2,  
wherein said controller controls the injection quantity per unit time to become larger as the valve operating angle of said intake valve is smaller.
7. An apparatus for controlling fuel injection of an engine according to claim 1,  
wherein said injection quantity regulator is a fuel pressure regulator varying a pressure of fuel supplied to said fuel injection valve, and regulates the injection quantity per unit time by regulating the pressure of fuel.

8. An apparatus for controlling fuel injection of an engine according to claim 1,  
wherein said injection quantity regulator is a lift regulator regulating a lift of a valve body of said fuel injection valve, and regulates the injection quantity per unit time by regulating the lift of said valve body.
9. An apparatus for controlling fuel injection of an engine according to claim 2,  
wherein said engine is provided with a variable valve timing mechanism that varies a central phase of the valve operating angle of said intake valve, and  
in a predetermined low load region where closing timing of said intake valve is set before the bottom dead center by said variable valve event and lift mechanism and said variable valve timing mechanism,  
said controller controls said injection quantity regulator, so that a fuel injection period of said fuel injection valve becomes shorter than the opening period of said intake valve.
10. An apparatus for controlling fuel injection of an engine according to claim 2,  
wherein said variable valve event and lift mechanism comprises:  
a camshaft rotating linked with said engine;  
a control shaft disposed substantially in parallel to said camshaft;  
a control cam biased to be fixed to a periphery of said control shaft;  
a rocker arm swingingly and axially supported by said control cam;  
a swing driving member driving one end portion of said rocker arm to swing according to the rotation of said camshaft;  
a swing cam connected to the other portion of said rocker arm to swing, and operating said intake valve to be opened; and  
an actuator driving said control shaft to be rotated.
11. An apparatus for controlling fuel injection of an engine provided with an intake valve and a fuel injection valve disposed on the upstream side of said intake valve, comprising:  
injection quantity regulating means for varying an injection quantity per unit time of said fuel injection valve;  
opening period detecting means for detecting an opening period of said intake valve;  
and  
control means for controlling said injection quantity regulating means according to the opening period detected by said opening period detecting means.
12. A method of controlling fuel injection of an engine provided with an intake valve and a fuel injection valve disposed on the upstream side of said intake valve, comprising the steps of:

detecting an opening period of said intake valve; and  
controlling an injection quantity per unit time of said fuel injection valve.

13. A method of controlling fuel injection of an engine according to claim 12,  
wherein said engine is provided with a variable valve event and lift mechanism that varies a valve lift and a valve operating angle of said intake valve, and  
said step of detecting the opening period detects a valve operating angle of said intake valve and a rotation speed of said engine as a state amount correlating to the opening period of said intake valve.
14. A method of controlling fuel injection of an engine according to claim 13,  
wherein said step of controlling the injection quantity per unit time controls the injection quantity per unit time, so that a fuel injection period of said fuel injection valve becomes shorter than the opening period of said intake valve at least in a low valve lift region of said intake valve.
15. A method of controlling fuel injection of an engine according to claim 14, further comprising the step of;  
controlling injection timing of said fuel injection valve, so that fuel injection by said fuel injection valve is performed within the opening period of said intake valve at least in the low valve lift region.
16. A method of controlling fuel injection of an engine according to claim 13,  
wherein said step of controlling the injection quantity per unit time controls the injection quantity per unit time to become larger as the rotation speed of said engine is higher.
17. A method of controlling fuel injection of an engine according to claim 13,  
wherein said step of controlling the injection quantity per unit time controls the injection quantity per unit time to become larger as the valve operating angle of said intake valve is smaller.
18. A method of controlling fuel injection of an engine according to claim 12,  
wherein said step of controlling the injection quantity per unit time controls a pressure of fuel supplied to said fuel injection valve, to control the injection quantity per unit time of said fuel injection valve.
19. A method of controlling fuel injection of an engine according to claim 12,  
wherein said step of controlling the injection quantity per unit time controls a lift of a

valve body of said fuel injection valve, to control the injection quantity per unit time of said fuel injection valve.

20. A method of controlling fuel injection of an engine according to claim 13,  
wherein said engine is provided with a variable valve timing mechanism that varies a central phase of the valve operating angle of said intake valve, and  
in a predetermined low load region where closing timing of said intake valve is set before the bottom dead center by said variable valve event and lift mechanism and said variable valve timing mechanism,  
said step of controlling the injection quantity per unit time controls the injection quantity of said fuel injection valve, so that a fuel injection period of said fuel injection valve becomes shorter than the opening period of said intake valve.